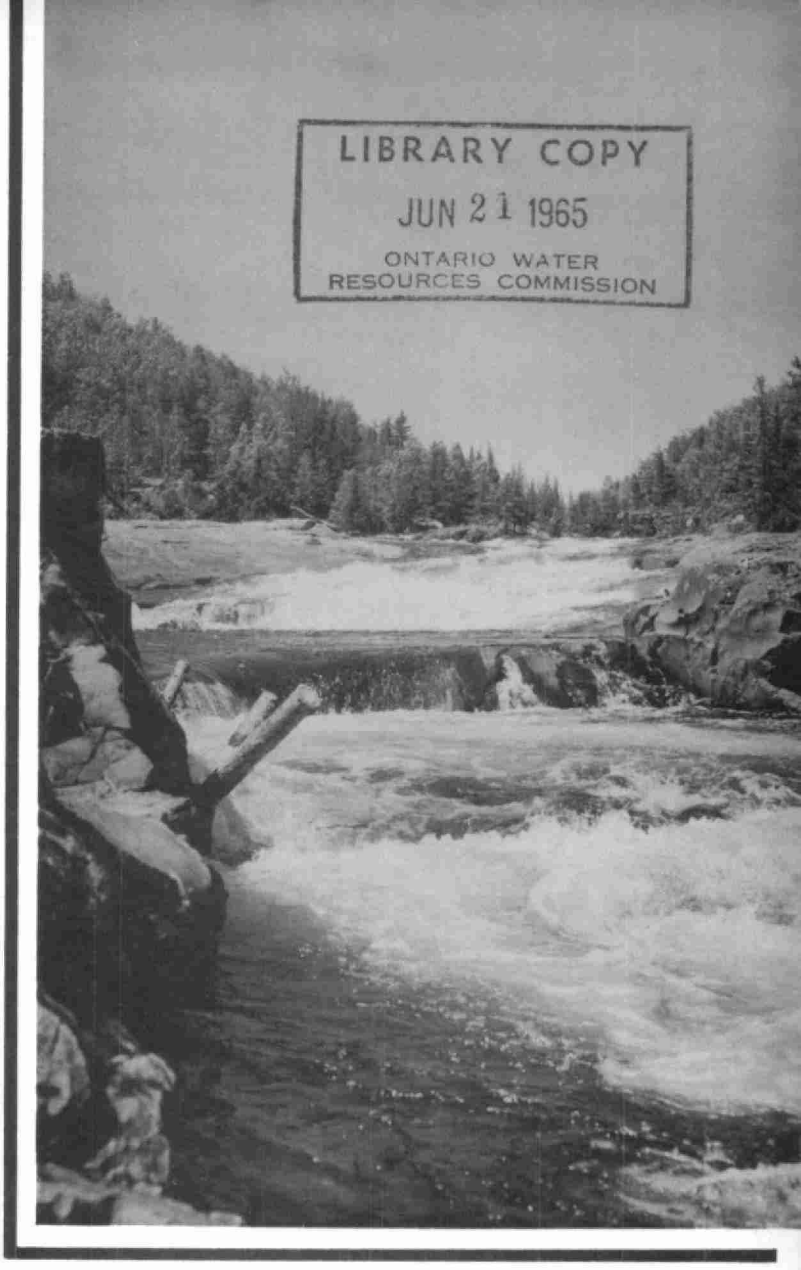
Nepean Sewage Treatment Plant



1963 Annual Report

Ontario Water Resources Commission

ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Reeve and Members of Council,
Township of Nepean.

Gentlemen:

I am pleased to submit, for your information, the 1963 Annual Operating Report of the Nepean Sewage Treatment Plant, OWRC Project No. 59-S-35, which has been prepared by our Division of Plant Operations.

We are grateful for the kind cooperation which you and your staff have extended to our Operations staff throughout the year. We look forward to a continuing close association with you in our mutual endeavour to control pollution.

Yours very truly,

D. S. Caverly,
General Manager

General Manager,
Ontario Water Resources Commission.

Dear Sir:

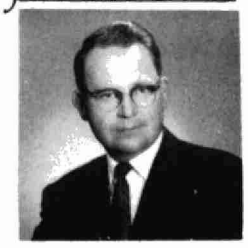
It is with pleasure that I present to you the Annual Report of the operation of the Nepean Sewage Treatment Plant, OWRC Project No. 59-S-35.

This report presents design data, outlines operating problems encountered and summarizes in tables, charts and graphs all significant flow and cost data.

Yours very truly,

B. C. Palmer,
Director,
Division of Plant Operations.

foreword



This report is designed to present the highlights of the operation of these works during 1963. Trends in flows and other operating data can be extremely useful in the development of necessary long range enlargement and improvement programs.

In addition to the activities reported herein, much unrecorded effort has contributed to the success of this operation. The municipality, through representatives on the Local Advisory Committee, has given valuable assistance in reviewing salary schedules, detailed operating budgets, personnel problems, flow patterns, and major maintenance problems.

The Division of Plant Operations has provided direction to the field staff in administrative procedures, quality control, maintenance schedules, equipment inspection and purchase supervision. A number of other Divisions of the Commission have been of service. The Division of Construction has offered helpful advice on equipment selection and renovation problems. The Division of Sanitary Engineering has maintained, through its District Engineering staff, a keen interest in the operation and has made a number of constructive recommendations. Its operator training courses have been very helpful. The Division of Finance has processed many payrolls, purchase orders and invoices dealing directly with this project. The Commission Personnel Director has been most helpful in counselling of personnel problems.

The excellent cooperation of all of these groups is gratefully acknowledged.

B. C. Palmer,
Director,
Division of Plant Operations

C. W. Perry,
Assistant Director
D. A. McTavish,
Regional Supervisor
J. N. Dick,
Operations Engineer

DIVISION OF PLANT OPERATIONS

contents

NEPEAN SEWAGE TREATMENT PLANT

OPERATED FOR

THE TOWNSHIP OF NEPEAN

BY

THE ONTARIO WATER RESOURCES COMMISSION

CHAIRMAN

A. M. Snider

COMMISSIONERS

W. D. Conklin, Q. C.
J. H. H. Root, M. P. P.
J. A. Vance, LL. D.
A. A. Wishart, Q. C., M. P. P.

GENERAL MANAGER

D. S. Caverly

ASSISTANT GENERAL MANAGERS

G. M. Galimbert
L. E. Owers

COMMISSION SECRETARY

W. S. MacDonnell

1959 to 1963 History

INCEPTION

On January 12, 1959, the Council of the Township of Nepean passed a resolution requesting the Ontario Water Resources Commission to undertake the construction of a trunk sewer line and sewage treatment plant. The Township Engineer, J. A. Chalmers, was engaged to prepare plans and specifications for the trunk sewer and the firm of Beaco Limited to prepare plans and specifications for the sewage treatment plant.

APPROVAL

In 1959, the Township of Nepean signed an agreement with the Ontario Water Resources Commission to finance, construct and operate the system.

CONSTRUCTION

Spino Construction Company Limited, Montreal, Quebec and Keystone Contractors Limited, Ottawa, Ontario began the construction of the trunk sewer early in 1960. George A. Crain and Sons Limited, Ottawa, Ontario began the construction of the sewage treatment plant in 1961. Late in the year 1961, the Division of Plant Operations took over the operation of the plant.

TOTAL COST

59-S-35	$ 1,351,191.62
61-S-76	162,540.24

Project Staff

D. Forbes,
Chief Operator

Operators:	D. Fraser
	W. Amey
Casual Labourer:	B. Arcand

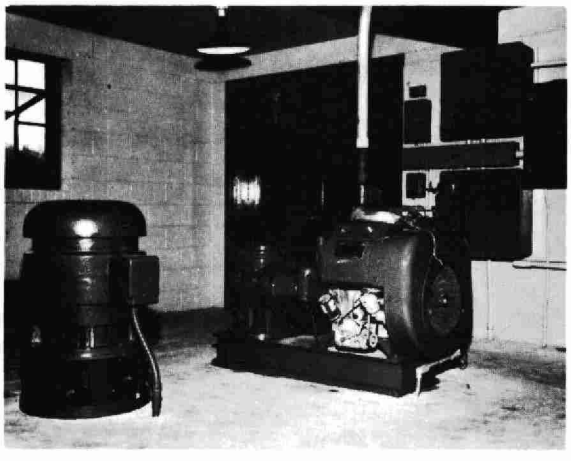
As shown above, the total staff complement is four men, one being a casual labourer employed for the summer months. During 1963, there was one resignation in the latter part of the year and the casual labourer was kept on at the plant to aid in the transitional period. Interviews for a replacement were being initiated in December of 1963.

The Chief Operator received a Certificate of Qualification as a sewage works operator as a result of his successful completion of a series of three weekly courses of instruction sponsored by the OWRC.

Description of Project

INFLUENT WORKS

The waste from the north east section of the Township of Nepean is directed by gravity sewers and trunk sewers to the Woodroffe Avenue pumping station. At the Woodroffe Avenue pumping station the waste is lifted into a 30 inch trunk sewer that follows the northern limit of the township picking up waste from Bell's Corners and other subdivisions along the way and conveying it to the Shirley's Bay pumping station.



The raw waste is pumped from the Shirley's Bay pumping station via a 16 inch force main to the influent works of the plant. In the influent works, the waste flows through a bar screen where any large objects are removed and then into either one of two grit channels. In the grit channels, the flow is regulated so that the grit and sand settle out but the organic material remains in suspension. The grit channels are occasionally drained and the settled material manually removed and discarded.

PRIMARY SETTLING TANKS

In the two rectangular primary settling tanks, the waste is retained for 1.75 hours at design flow and approximately 50 percent of the suspended matter settles to the bottom of the tanks. Each settling tank is equipped with a scraper mechanism which moves the settled sludge to a hopper located at the bottom of the tank. The sludge is pumped from the settling tank to the digestion tank. Floating material is skimmed off the top of the tank and also pumped to the digestion tank.

AERATION

Settled sewage from the primary settling tanks flows by gravity to the aeration tanks where it is mixed with biologically active sludge which is returned from the final settling tanks. In the aeration tanks, the waste is retained for 6.75 hours at design flow to enable the biologically active floc to oxidize and assimilate the polluting organic matter still remaining in the waste.

It is possible to add primary effluent to the aeration tanks at various points. This permits the use of modifications to the activated sludge process such as step aeration.

Air and agitation is supplied to the process by six mechanical aerators equipped with two 15 HP motors. The tank contents are turned over every 15 minutes.

FINAL SETTLING TANKS

The mixed liquor from the aeration section is retained in the final settling tanks for 1.75 hours at design flow and allows the activated sludge to settle in the tanks. The sludge is scraped to the one end of the tank by a scraper mechanism and collected on the bottom of the tanks from where it is pumped by two 800 IGPM pumps to a splitter box. The splitter box is employed to control the wasting of excess sludge to the primary settling tanks. The remaining liquid flows over the weirs of the final settling tanks and is chlorinated in the chlorine contact chamber for approximately 15 minutes and then flows to Watts Creek as the final effluent.

SLUDGE DIGESTION TANKS

The Township of Nepean utilizes single stage digestion. The sludge from the primary settling tanks is automatically pumped to the digester by a pre-set timer mechanism.

The digester is equipped with a floating steel cover. The contents of the digester are mixed by a Pearth gas recirculating system which collects the gas produced by the decomposition of the sludge and forces it back into the contents under pressure. Heat is applied to the digester by a heat exchanger located in the control building. The digester contents are circulated through the heat exchanger by two 150 US GPM pumps.

The digested sludge can be pumped on to the sludge drying beds or to the sludge lagoons. Here it is dried and used for land fill.

Design–Data

GENERAL

Type of Plant - Activated sludge.

Design Population - 15,000 persons.

Per Capita Flow - 100 gallons per capita per day.

Design Plant Flow - 1,500,000 gallons per day.

Five Day BOD -

Raw Sewage	-	140 PPM
Removal	-	95%

Suspended Solids -

Raw Sewage	-	295 PPM
Removal	-	90%

PRIMARY TREATMENT

Influent Sewer

Sixteen inch force main from Shirley's Bay pumping station.

Screening

Manually cleaned bar screen with two inch spaces.

Grit Removal

Two manually cleaned grit removal channels - 35'6" x 3'6" x 1'6".

Volume - 184 cubic feet or 1,080 gallons.

Detention period - 1.16 minutes at design flow.

PRIMARY SETTLING TANKS

Units - Two 60' x 15' x 9'.

Volume - 17,200 cubic feet or 10,750 Imperial gallons.

Detention time - 1.72 hours at design flow.

Surface Settling Rate - 835 Imperial gallons per square foot of tank per day

Weir Overflow Rate - 8,350 Imperial gallons per lineal foot of weir per day.

Manually operated scum troughs.

SECONDARY TREATMENT

Aeration Section

Two rectangular aeration tanks - 90' x 30' x 12'6".

Volume - 67,500 cubic feet, or 420,000 Imperial gallons.

Detention time - 6.75 hours at a design flow of 1.5 MGD.

Air Supply

Six mechanical type aerators.

Simplex high intensity aerating cones as manufactured by Ames Crosta Mills Co. Ltd.

Secondary Settling Tanks

Two rectangular concrete settling tanks with United Steel Corporation Limited

collectors.

Units - Two 60' x 15' x 9'.

Volume - 17,200 cubic feet or 10,750 Imperial gallons.

Detention time - 1.72 hours at design flow.

Surface Settling Rate - 835 Imperial gallons per square foot of tank per day.

The return sludge is pumped to a splitter box from sludge wet well by two "Allispede" Smart-Turner Machine Co. Ltd. pumps of 800 IGPM capacity.

Digester

One concrete tank 60 feet in diameter by 21' SWD.

Volume - 59,200 cubic feet or 370,000 gallons.

The tank covered by a Pacific Flush Tank Company floating steel cover and contents agitated by a 150 cubic feet per minute Pearth Gas Recirculation Unit.

Loading - 4.0 cubic feet per capita. 2.02 pounds solids per cubic foot of tank per month.

Disposal - Sludge drying beds and sludge lagooning.

Heat Exchanger

One Pacific Flush Tank Company No. 370 heat exchanger.

Chlorination

Dimension of Tank - 32' x 16' x 5'6" - 2,820 cubic feetor 17,800 gallons.

Detention time - 17 minutes at design flow.

One Wallace and Tiernan chlorinator, Type A-731.

Sand Filters

Four sand filter beds 175' x 175' each.

Used during summer months.

PUMPING STATIONS

Woodroffe Avenue Pumping Station

Unit No. 1

10 HP electrically driven "Buffalo" pump - 300 USGPM @ 46 foot TDH. RPM - 1175

Unit No. 2

20 HP electrically driven "Buffalo" pump - 850 USGPM @ 46 foot TDH. RPM.- 1175

Unit No. 3

25 HP electrically driven "Buffalo" pump - 1400 USGPM @ 46 foot TDH. RPM - 900

Standby Engine - Wisconsin air-cooled Type - VG-40.

Shirley's Bay Pumping Station

Unit No. 1

30/22 HP electrically driven "Buffalo" pump.

Capacity - 700-500 Imperial GPM @ 33.5 foot TDH.

RPM - 1150 - Capacity - 1675

Impeller Size - 12 1/2 inches.

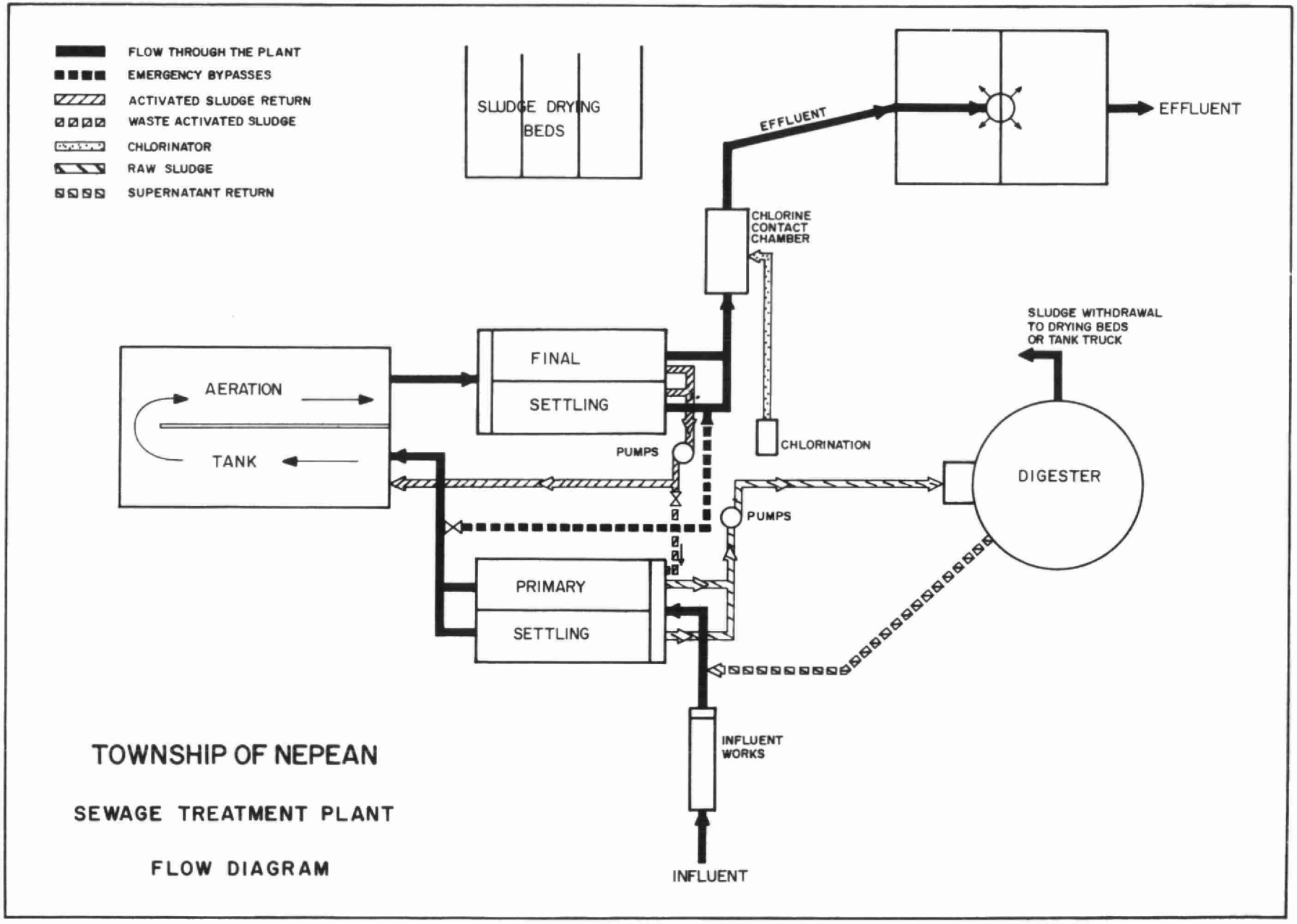
Unit No. 2

30/22 HP electrically driven "Buffalo" pump.

Capacity - 700-750 Imperial GPM @ 35.0 foot TDH.

RPM - 1150 - Capacity 1850

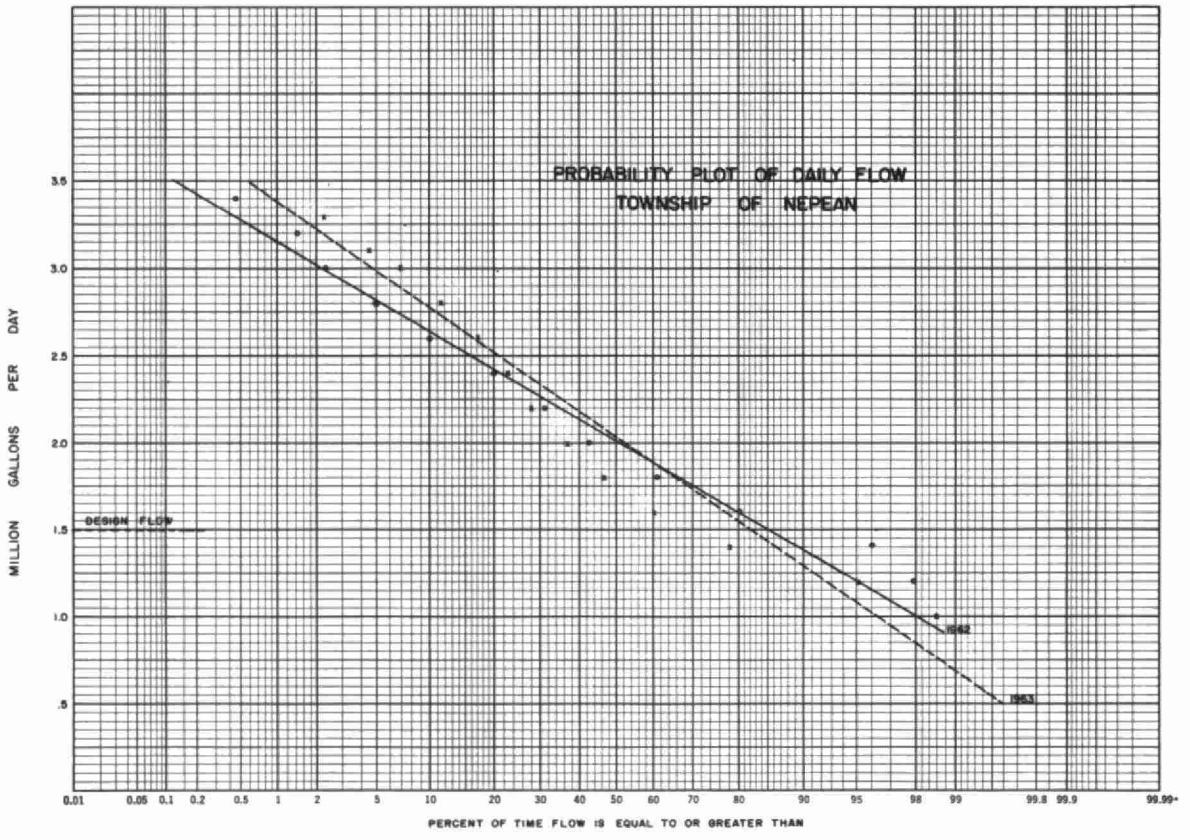
Impeller Size - 13.0 inches.

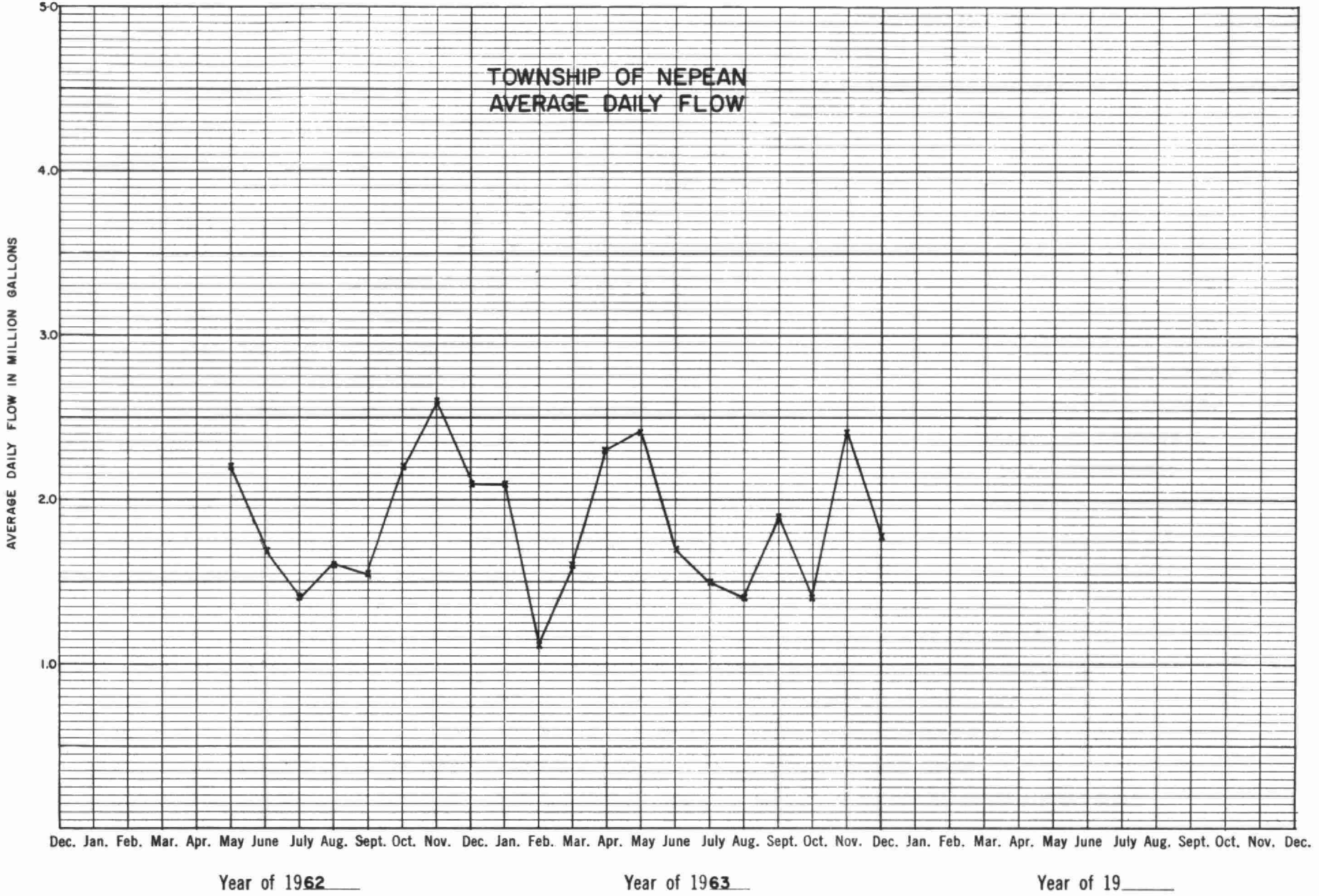

FLOW THROUGH THE PLANT
EMERGENCY BYPASSES
ACTIVATED SLUDGE RETURN
WASTE ACTIVATED SLUDGE
CHLORINATOR
RAW SLUDGE
SUPERNATANT RETURN
SLUDGE DRYING BEDS
EFFLUENT
EFFLUENT
CHLORINE CONTACT CHAMBER
SLUDGE WITHDRAWAL TO DRYING BEDS OR TANK TRUCK
FINAL
SETTLING
AERATION
TANK
PUMPS
CHLORINATION
DIGESTER
PUMPS
PRIMARY
SETTLING
INFLUENT WORKS
INFLUENT
TOWNSHIP OF NEPEAN
SEWAGE TREATMENT PLANT
FLOW DIAGRAM

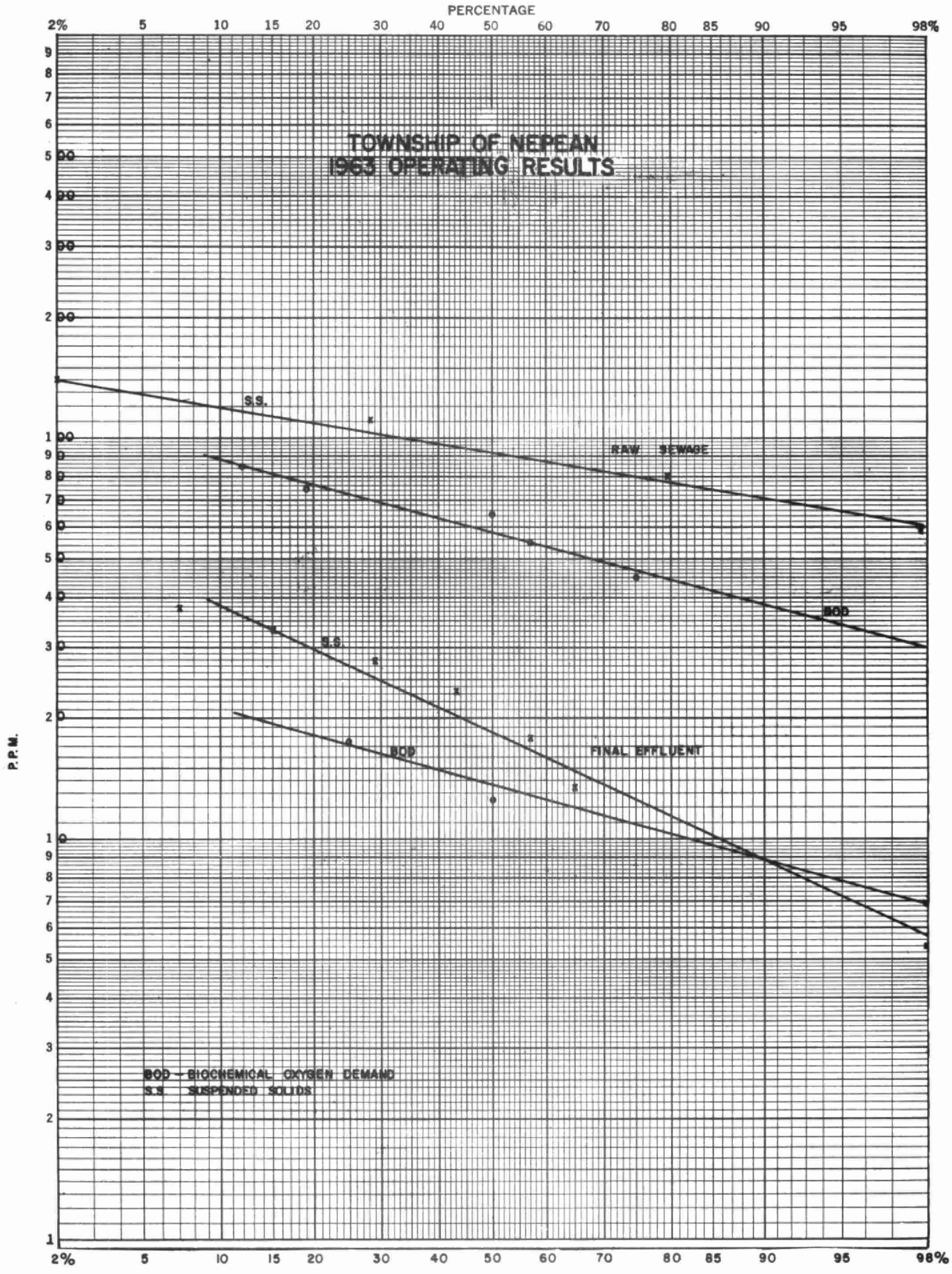
Process Data

From the probability plot, it will be noted that in 1962 the plant received 2.4 MGD twenty percent of the time. In 1963, the plant received 2.4 MGD twenty percent of the time. The increased slope of the 1963 plot indicates that higher flows are being noted more frequently than in the previous year.

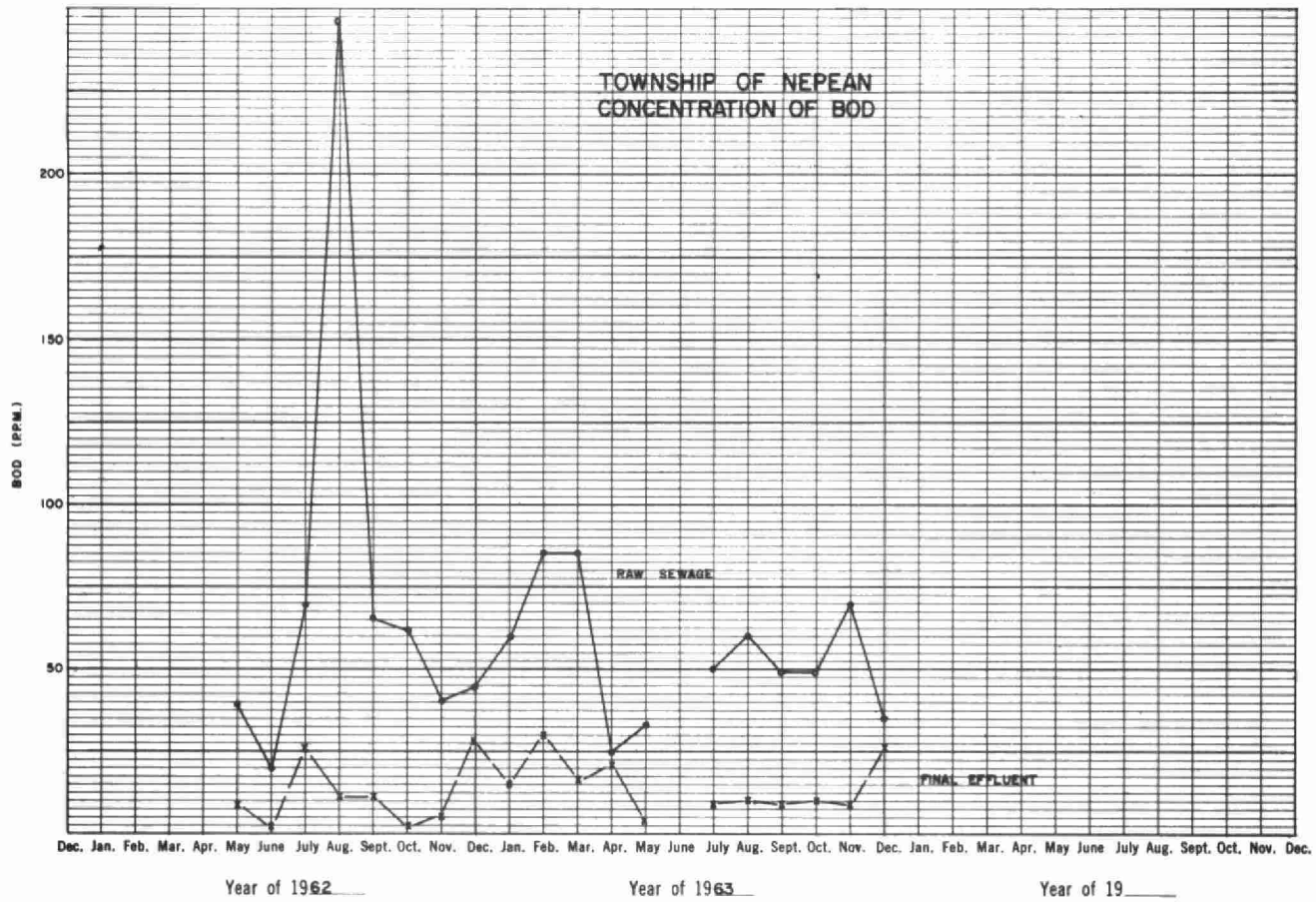
It should be noted, however, that not all of the flow necessarily reaches the plant because once the capacity of the Shirley's Bay pumping station is exceeded, the flow begins to by-pass into Watts Creek.

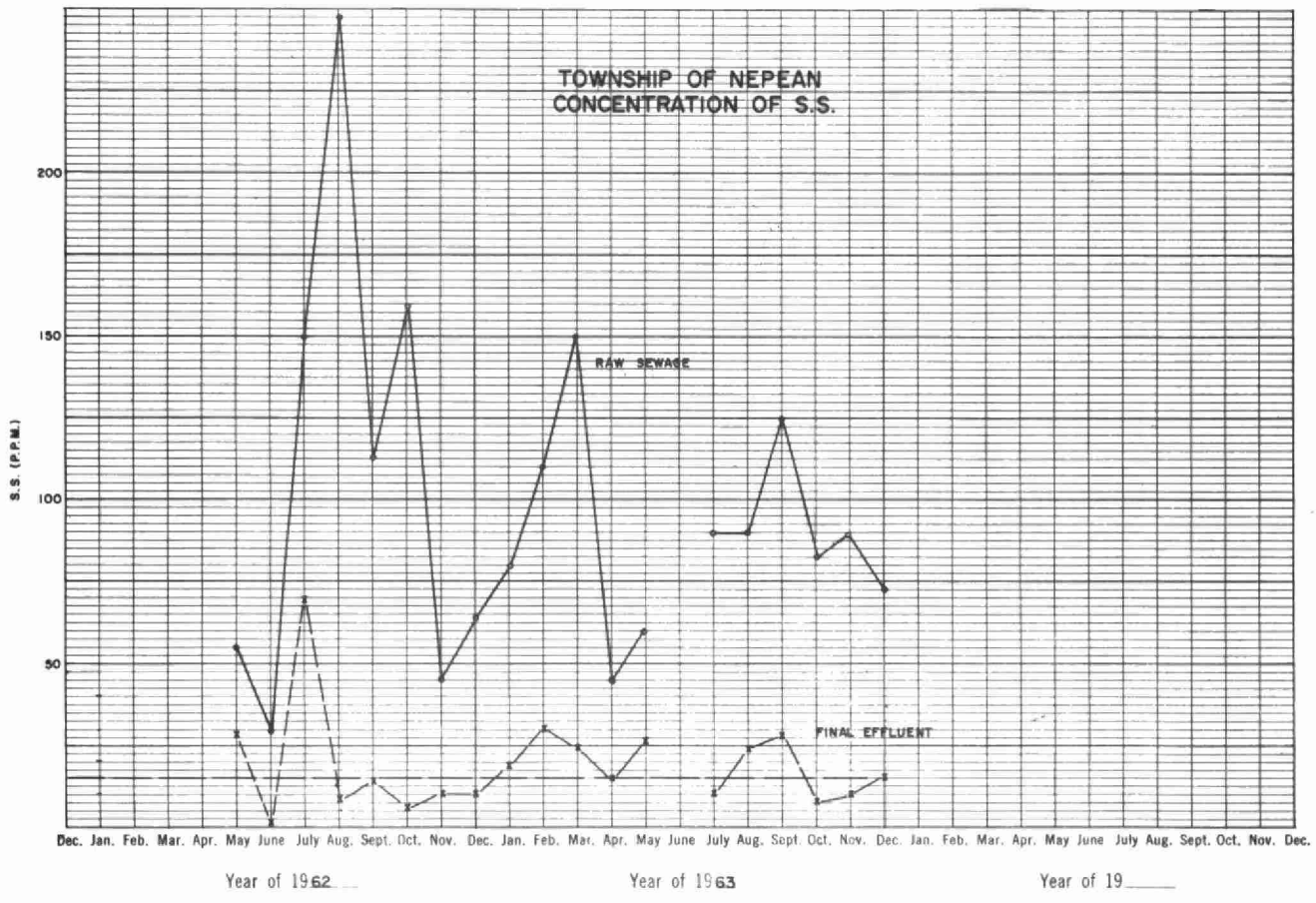



TOWNSHIP OF NEPEAN
AVERAGE DAILY FLOW
AVERAGE DAILY FLOW IN MILLION GALLONS
5.0
4.0
3.0
2.0
1.0
Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
Year of 1962
Year of 1963
Year of 19



PERCENT OF TIME CONCENTRATION IS EQUAL TO OR GREATER THAN


TOWNSHIP OF NEPEAN
CONCENTRATION OF BOD
BOD (PPM.)
200
150
100
50
RAW SEWAGE
FINAL EFFLUENT
Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
Year of 1962
Year of 1963
Year of 19____


TOWNSHIP OF NEPEAN
CONCENTRATION OF S.S.
S.S. (P.P.M.)
200
150
100
50
RAW SEWAGE
FINAL EFFLUENT
Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
Year of 1962
Year of 1963
Year of 19____

GRIT, B.O.D AND S.S. REMOVAL

MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	
JAN.	60	15	75	14.8	79	20	75	19.3	-
FEB.	86	30	65	9.0	109	31	71	12.5	-
MAR.	85	18	79	17.3	151	24	84	32.7	-
APR.	22	18	18	1.4	45	16	65	10.2	-
MAY	33	8	75	9.2	58	27	54	11.5	-
JUNE									54
JULY	50	8	84	9.7	88	9	90	18.3	-
AUG.	61	10	83	11.0	90	23	75	14.5	-
SEPT.	47	8	83	11.3	124	28	78	27.8	-
OCT.	49	10	80	8.5	83	7	92	16.5	32
NOV.	69	8	86	22.1	89	5	95	30.3	-
DEC.	36	26	28	3.5	73	14	81	20.7	-
TOTAL				117.8				214.3	86
AVG.	54	14	69	10.7	90	19	78	20.0	-

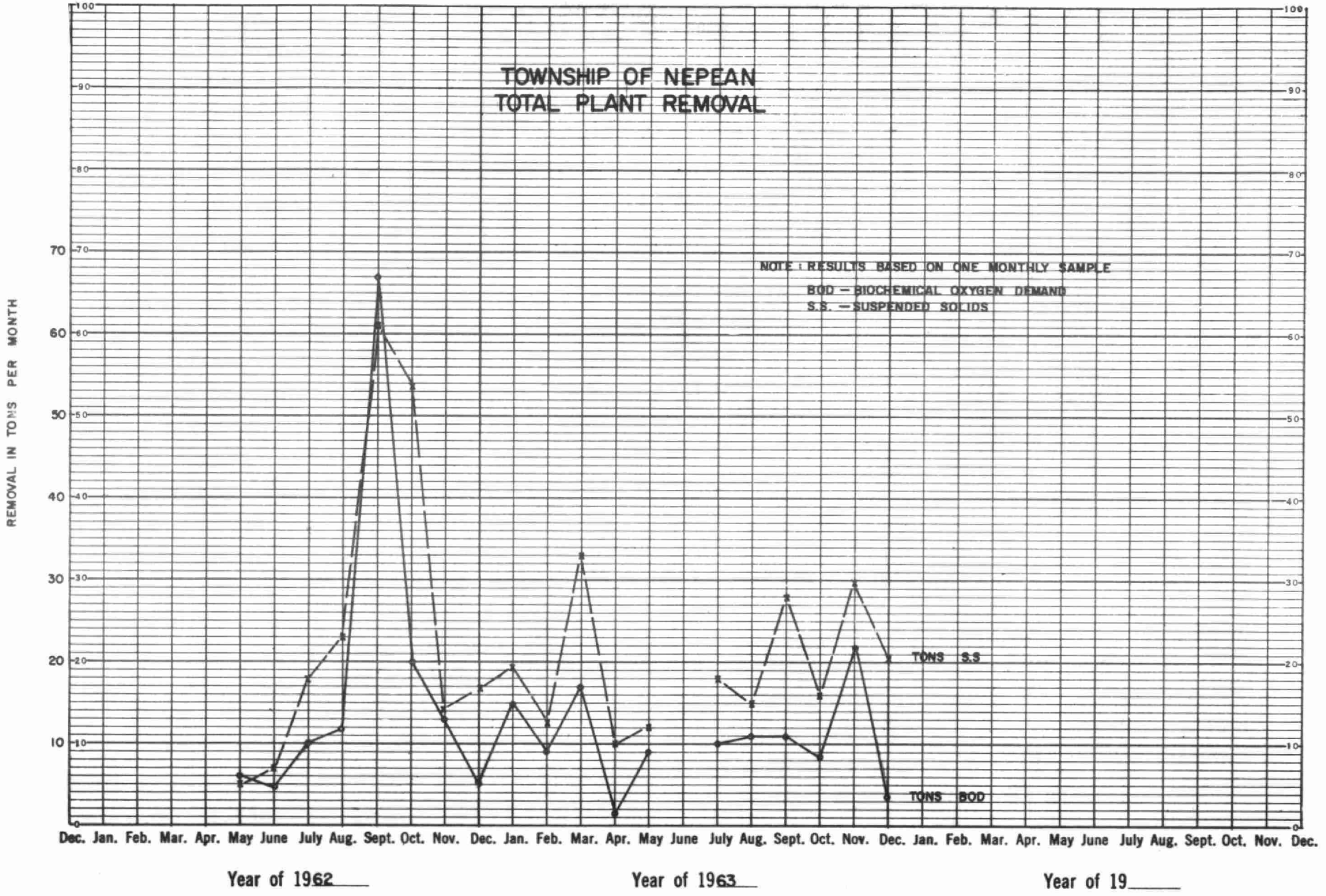
INFL. - INFLUENT OR RAW SEWAGE
EFFL. - EFFLUENT OR FINAL PRODUCT
P.P.M. - PARTS PER MILLION
S.S. - SUSPENDED SOLIDS

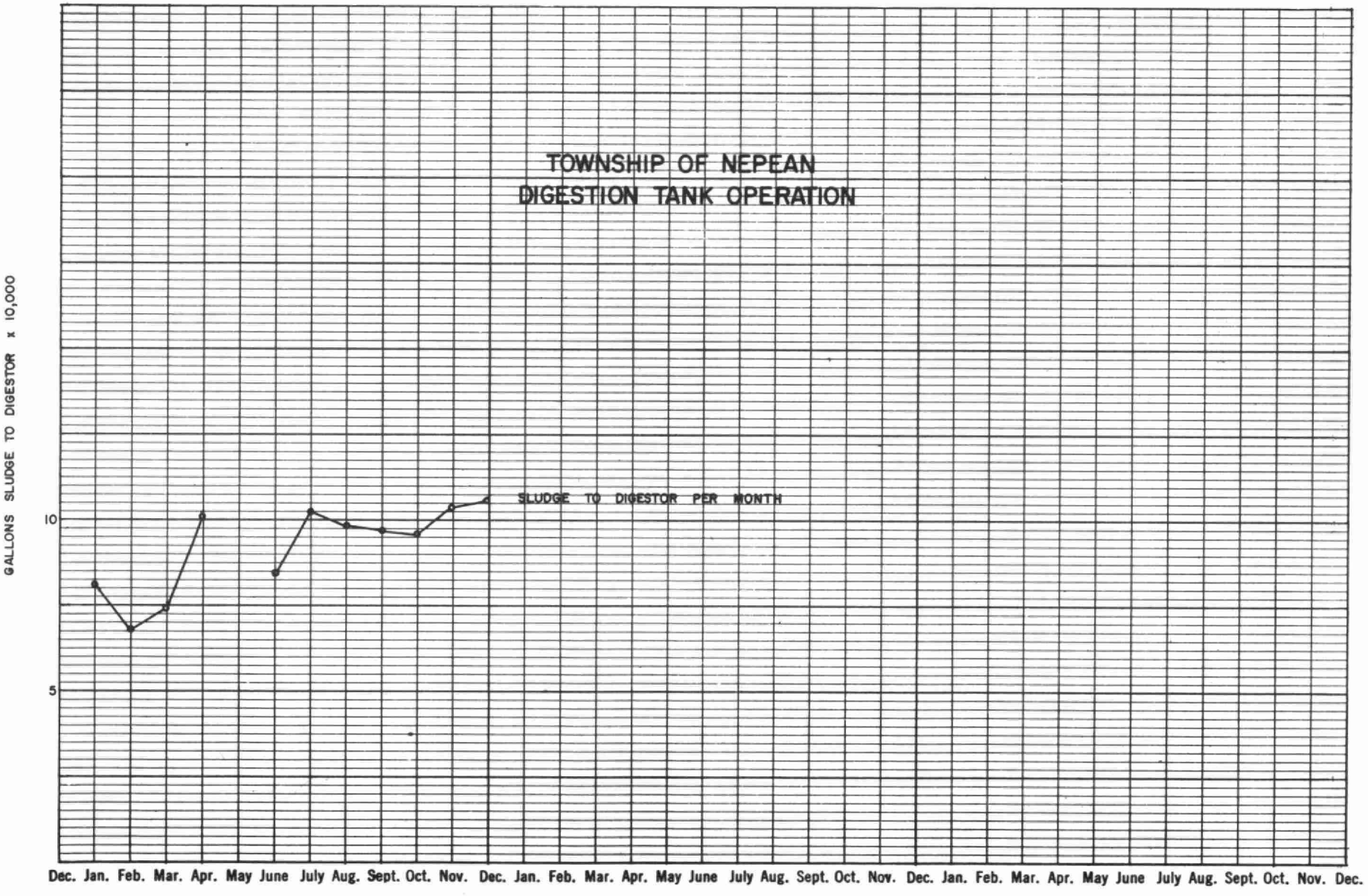
COMMENTS

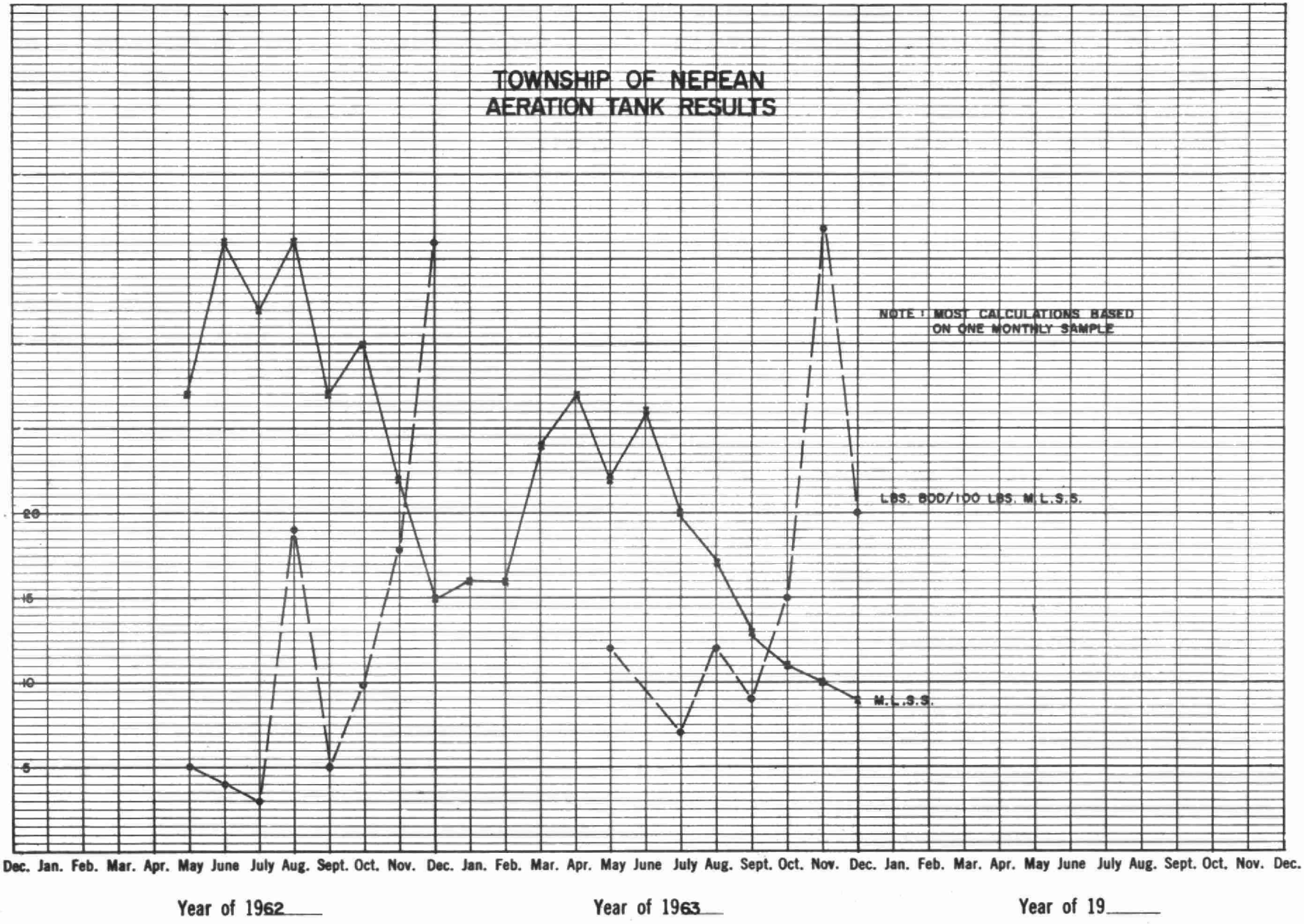
The waste received at the plant in 1963 had an average BOD of 54 PPM. The average BOD removed at the plant was 69 percent resulting in an effluent of 15 PPM BOD. The average strength of the final effluent is within the OWRC objectives. The raw sewage is quite weak for a domestic waste.

The waste contained an average of 90 PPM of suspended solids. The average removal of suspended solids was 78 percent. The suspended solids concentration in the raw waste is considerably greater than the BOD.

The amount of grit received at the plant is small indicating little combined waste in the system.


TOWNSHIP OF NEPEAN
TOTAL PLANT REMOVAL
NOTE : RESULTS BASED ON ONE MONTHLY SAMPLE
BOD — BIOCHEMICAL OXYGEN DEMAND
S.S. — SUSPENDED SOLIDS
TONS S.S
TONS BOD
REMOVAL IN TONS PER MONTH
0 10 20 30 40 50 60 70 80 90 100
Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
Year of 1962
Year of 1963
Year of 19


TOWNSHIP OF NEPEAN
DIGESTION TANK OPERATION
GALLONS SLUDGE TO DIGESTOR x 10,000
10
5
SLUDGE TO DIGESTOR PER MONTH
Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
Year of 1963
Year of 19____
Year of 19____


TOWNSHIP OF NEPEAN
AERATION TANK RESULTS
NOTE : MOST CALCULATIONS BASED ON ONE MONTHLY SAMPLE
LBS. BOD/100 LBS. M.L.S.S.
M.L.S.S.
MIXED LIQUOR SUSPENDED SOLIDS x 1000
LBS. BOD/100 LBS. M.L.S.S.
20
15
10
5
Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
Year of 1962
Year of 1963
Year of 19

AERATION SECTION

MONTH	PRIM. EFFL B.O.D. P.P.M.	M.L.S.S. P.P.M.	LBS. B.O.D. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. B.O.D. REMOVED
JANUARY		1600		
FEBRUARY		1600		
MARCH		2400		
APRIL		2800		
MAY	44	2200	10	
JUNE		2600		
JULY	37	2100	7	
AUGUST	54	1700	12	
SEPTEMBER	24	1300	9	
OCTOBER	47	1100	15	
NOVEMBER	64	1000	28	
DECEMBER	33	900	24	
TOTAL				
AVERAGE				

COMMENTS

It will be noted that the BOD loading to the aeration tanks was rather low. This can be contributed to the weak primary effluent which is a result of the rather large infiltration of ground water into the sanitary sewer system.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	65.8		
FEBRUARY	30.9		
MARCH	51.6		
APRIL	70.4		
MAY	74.4	1099	
JUNE	52.4	1476	2.8
JULY	46.3	1360	2.9
AUGUST	43.2	2137	4.9
SEPTEMBER	58.0	2174	3.8
OCTOBER	43.4	695	
NOVEMBER	72.1		
DECEMBER	70.2		
TOTAL			
AVERAGE			4.8

COMMENTS

Chlorine at this plant is normally used for disinfection of the final effluent during the months from May 15 to October 15 inclusive. Approximately 4.8 PPM of chlorine is necessary to give the final effluent a residual chlorine of 0.5 PPM after a retention of 15 minutes.

1963

PLANT — **Total Operating Costs** — **MONTHLY**

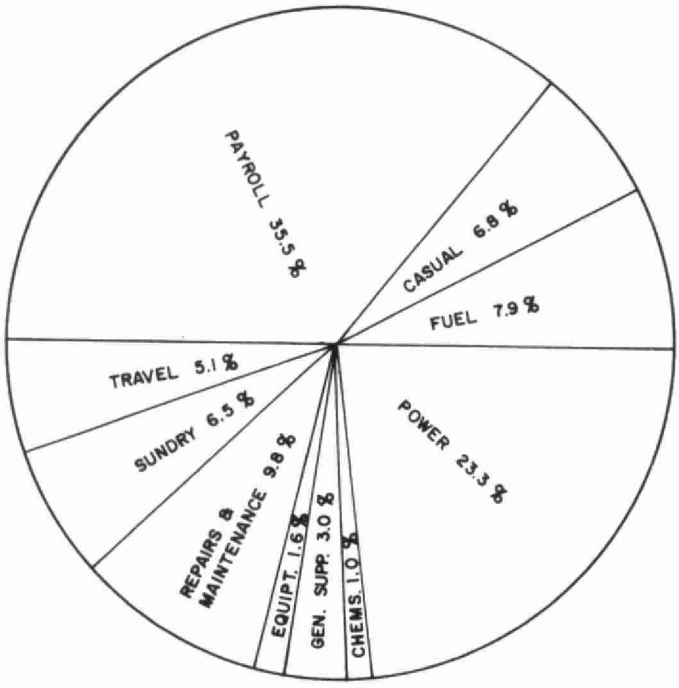
MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY	WATER
JAN	1855.39	966.28	71.18	129.54	627.60		13.09				47.70
FEB	1981.03	959.34		130.53	661.83	300.58*	87.98		274.43	65.00	102.50
MARCH	1543.96	959.34		432.75	590.54	1190.00*	80.25		384.42	143.96	142.70
APRIL	2348.04	959.34		185.80	608.43		38.14		343.73	111.10	102.50
MAY	2656.92	969.43		227.47	659.22		73.77	4.56	340.24	187.68	194.55
JUNE	2143.42	959.34	33.60		639.55		141.76	231.53	23.58	19.16	94.90
JULY	2536.86	1462.02	534.76	108.04	588.51	490.00*	53.57	114.20	17.00	22.06	126.70
AUG	4638.84	959.34	403.62		591.13	2296.10*	58.77		142.01	51.77	136.10
SEPT	2629.67	931.66	249.50	347.79	613.17		118.83	65.94	156.70	19.78	126.30
OCT	3963.63	959.34	216.96	16.36	644.65	168.05	41.59		501.02	1314.66	101.00
NOV	2239.97	959.34	238.20		584.60		80.15	23.21	111.31	34.01	209.15
DEC	3387.91	1219.27	372.38	889.04	614.07	735.00*	114.18	54.56	615.95	54.18	189.28
TOTAL	31,925.64	12,264.04	2,120.20	2,467.32	7423.30	251.43*	902.08	494.00	2910.39	2022.36	1573.38

PLANT — **YEARLY**

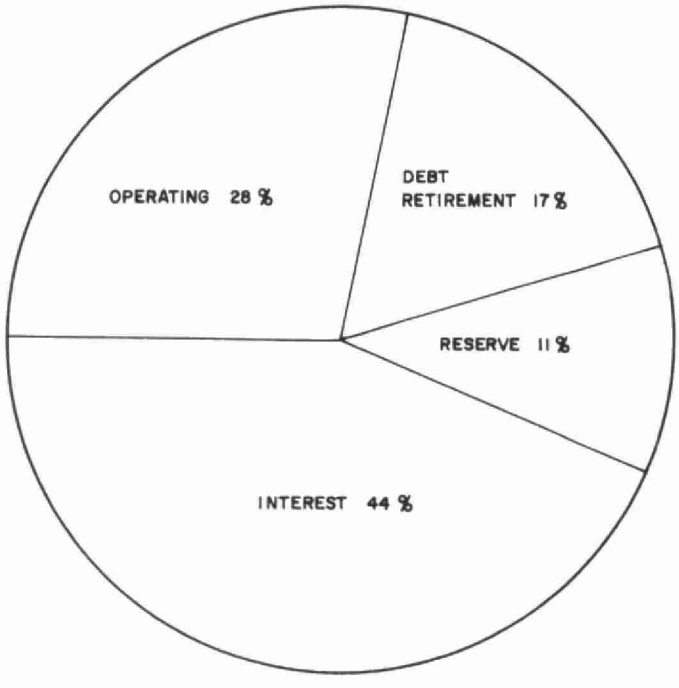
YEAR	M.G. TREATED	TOTAL COST	COST PER MILLION GALLONS	COST PER CAPITA PER YEAR
1961				
1962	660.0*	31,138.25	47.18	-
1963	678.8	31,925.64	47.08	-

* PRO-RATED FROM 8 MONTHS OF DATA

TOWNSHIP OF NEPEAN
1963 OPERATING COSTS



TOTAL COSTS
(BOTH PROJECTS)



SUMMARY

This report has given in detail significant data on the operation of the various units at the Township of Nepean Sewage Treatment Plant.

The average daily flow to the plant in 1963 was 1.85 million gallons per day. This value is greater than the average design flow of 1.5 million gallons per day.

The average concentration of BOD received at the plant in 1963 was 54 PPM. The average concentration of suspended solids received at the plant in 1963 was 73 PPM. This is an indication of a very weak domestic waste, probably because of a large amount of infiltration.

The operating costs of the plant in 1963 have not risen over those experienced in 1962. However, as the plant gets older more maintenance of plant equipment is anticipated.

Under constant supervision by head office engineers, the plant staff has operated and maintained a clean, attractive and efficient plant for the Township of Nepean. Special attention is directed towards good public relations and visitors are always welcome to visit the facilities.

RECOMMENDATIONS

1. Efforts should be continued to eliminate the infiltration into the sanitary sewers.

2. An engineering study of the sewage treatment facilities for the area is required.

3. The heating facilities at the treatment plant should be increased.

Total 1963 Costs

59-S-35

The total cost to the municipality during 1963 was as follows:

Operating	$ 31,925.64
Interest on over due quarter billing	$ 87.08
Debt Retirement	$ 15,639.00
Reserve	$ 10,435.00
Interest	$ 41,938.84
TOTAL	$ 100,025.56

The amount of funds in the Reserve for Contingency Fund on December 31, 1963 for this project was $21,755.64.

Total 1963 Costs

61-S-76

The total cost to the municipality during 1963 was as follows:

Operating	$ 28.46
Debt Retirement	$ 3,280.00
Reserve	$ 1,062.00
Interest	$ 9,049.29
TOTAL	$ 13,419.75

The amount of funds in the Reserve for Contingency Fund on December 31, 1963 for this project was $2,229.94.

Division of Plant Operations

ONTARIO WATER RESOURCES COMMISSION
801 BAY ST. TORONTO 5